

NEW NEARCTIC CHLOROPERLIDAE (PLECOPTERA)

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ABSTRACT.— *Alloperla furcula*, *A. hamata*, *A. roberti* and *Triznaka spinosa* are described from North America. A new genus, *Bisancora*, based on the new species *B. rutriformis*, is described and includes *B. pastina* (Jewett). *Alloperla quadrata* is synonymized with *A. leonarda* Ricker.

During biosystematic research on Nearctic Chloroperlidae, several new species and a new genus were discovered. *Alloperla quadrata* Harden & Mickel was found to be conspecific with *A. leonarda* Ricker.

Alloperla furcula, sp. nov. Figs. 1-5

General color beige in alcohol. Antennae pale proximally, darker distal to fifth segment, with dusky basal segment; head unpatterned except for three dark ocellar rings; occiput short with lateral edges tapering immediately posterior to compound eyes. Pronotum squarely oval, dusky laterally, narrower than head by width of compound eyes; mesonotum, metanotum, and abdomen lacking dark markings; cercal segments 7-9; copious setation slightly dusker than integument on legs, pronotum, forewings. Wings macropterous, hyaline, representative of genus.

MALE.— Forewing length 5.5 mm; body length 6.5 mm. Epiproct tip elongate, parallel-sided, fuscous, evenly sclerotized; apex bifurcate with acute prongs directed laterad almost perpendicular to long axis of epiproct tip; lateral aspect thin, tapered to ventrally hirsute apex; base set in enlarged cowl extending anteriorly to bifurcate apex. Basal anchor twice as wide as long; paragenital plates as wide as basal bar. Aedeagus membranous. Lateral brushes on segments 8 and 9.

FEMALE.— Forewing length 6.5 mm; body length 7 mm. Subgenital plate with sides sloping steeply to an acute median projection

one-half length of sternite 8; lateral aspect narrowly conical. Sternite 8, including subgenital plate, evenly hirsute except for a pair of sparsely haired patches on posterior half at base of subgenital plate flanking its swelled axis. Vagina membranous. Lateral brushes on segments 7 through 9.

MATERIAL.— Holotype ♂, allotype, paratypes 22 ♂, 118 ♀: South Carolina, Aiken Co., Upper Three Runs Crk., Savannah River Plant, 17-V-1977, Herlong and Prichard (USNM #76886). 37 ♂, 387 ♀ paratypes: South Carolina, Aiken Co., Upper Three Runs Crk., Savannah River Plant, 1-VI-1977, Herlong and Prichard (B. P. Stark, R. F. Surdick, J. C. Morse, R. W. Baumann).

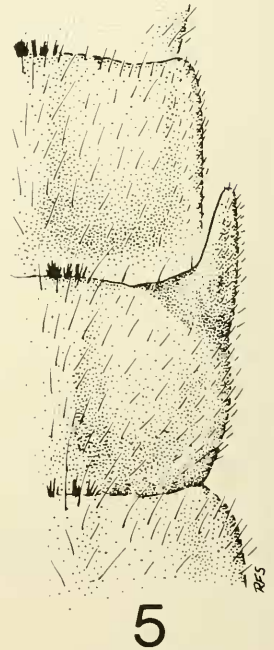
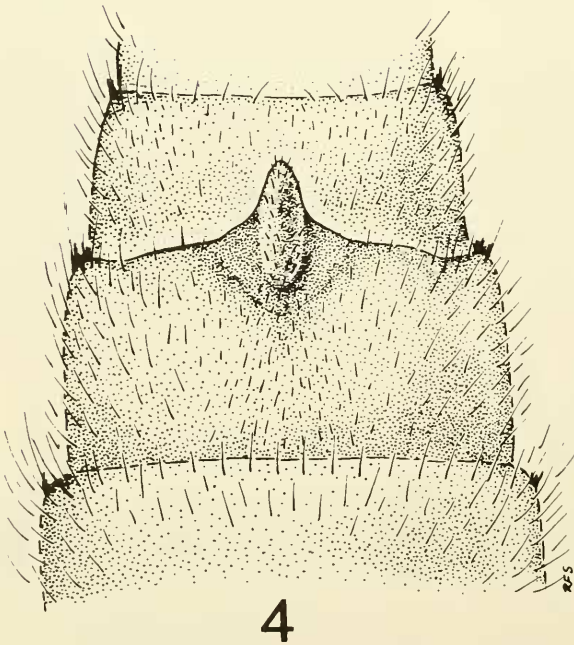
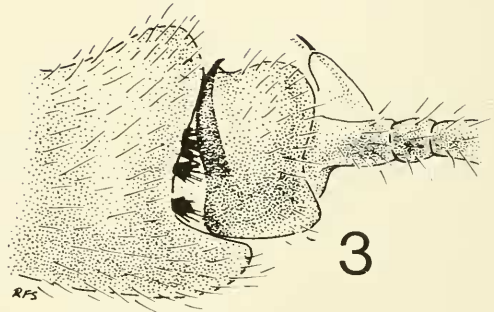
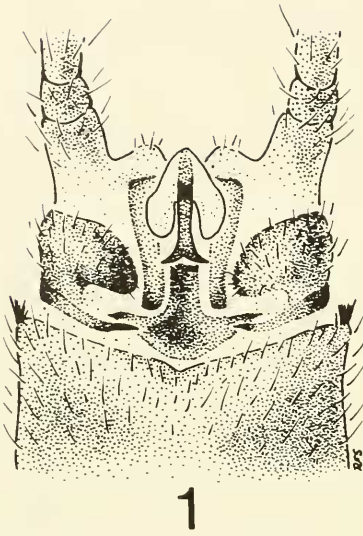
ETYMOLOGY.— The Latin adjective *furcula* refers to the small fork on the apex of the epiproct tip.

DIAGNOSIS.— *Alloperla furcula* differs from other species with similar epiprocts and cowls by the prominence of the apical prongs. *Alloperla natchez* Surdick & Stark bears a thinner, more tapered epiproct tip that has minute lateral extensions on the ventrally bent apex. *Alloperla leonarda* Ricker has small lateral projections on the blunt apex of the epiproct tip. The triangular, posterior projection of the subgenital plate is longer and more acute in *A. furcula* than in either of the other species.

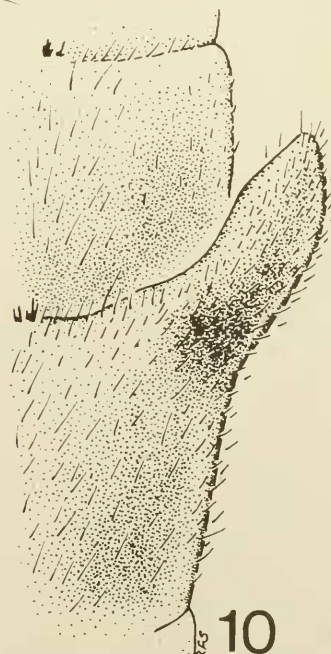
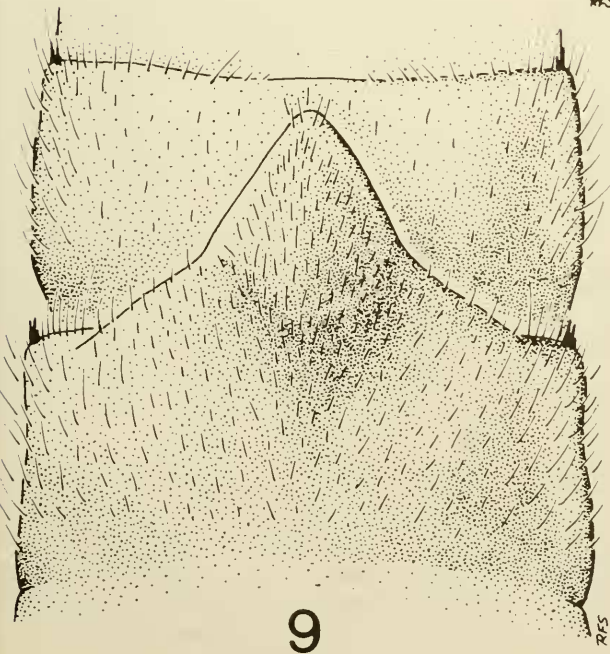
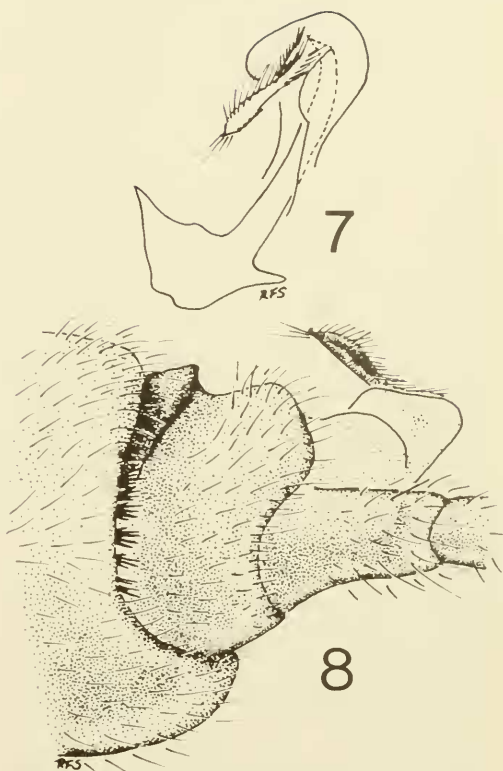
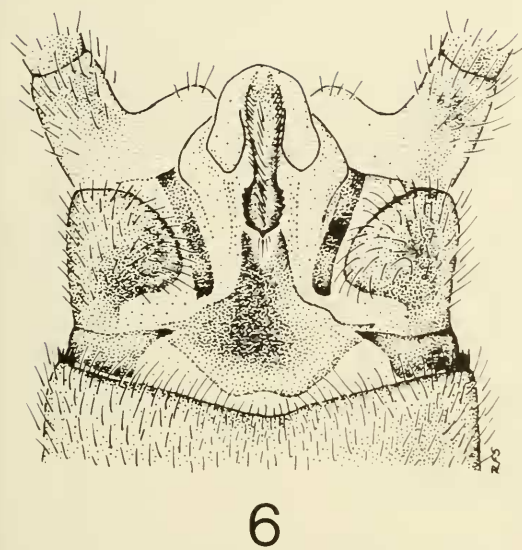
Alloperla hamata, sp. nov. Figs. 6-10, 16

General color pale yellow in alcohol. Antennae pale; head unpatterned except for three dark ocellar rings; occiput short with

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Figs. 1-5. *Alloperla furcula*: (1) male terminalia, dorsal; (2) epiproct, 3/4 view; (3) male terminalia, lateral; (4) female terminalia, ventral; (5) female terminalia, lateral.



Figs. 6-10. *Alloperla hamata*: (6) male terminalia, dorsal; (7) epiproct, 3/4 view; (8) male terminalia, lateral; (9) female terminalia, ventral; (10) female terminalia, lateral.

lateral edges tapering slowly, convexly, posterior to compound eyes. Pronotum squarely oval; narrower than head with indistinct, dusky reticulations; posterior margin twice as wide as anterior. Legs, mesonotum, metanotum, and abdomen lacking dark markings except for dusky sutures; cercal segments 9–10. Wings macropterous, hyaline, representative of genus without reduction in venation.

MALE.—Forewing length 9 mm; body length 8 mm. Epiproct tip elongate; basal two-thirds tapered; distal third swollen to width and thickness of base, with serrate lateral margins and apical upturned tooth; fine long hairs beneath apical tooth, along dorsal medial axis, and along lateral margins of basal tapering section. Cowl not enlarged. Basal anchor 1.5 times as wide as long; paragenital plates thinner than basal bar. Aedeagus membranous. Lateral brushes on segments 7 through 9.

FEMALE.—Forewing length 9–9.5 mm; body length 8.5–9 mm. Subgenital plate as long as sternite 8, extending posteriorly over half of sternite 9; lateral margins concave, with posterior halves forming terminal half of diamond-shaped conical swelling; swelling obvious in lateral aspect, forming half of subgenital plate. Subgenital plate evenly hirsute with longer hairs on margins; sternite 9 with evenly scattered fine hairs. Vagina membranous. Lateral brushes on segments 7 through 9.

MATERIAL.—Holotype ♂, allotype, 1 ♂, 2 ♀ paratypes: Alabama, Jackson Co., intermittent crk. adjacent Ala. Hwy. 65, 8.3 mi. N. jct. Ala. Hwy. 146, 16-IV-1976, A. M. James (USNM #76887). 1 ♂, 3 ♀ paratypes: Alabama, Jackson Co., Francisco, adjacent Ala. Hwy. 65, .7 mi. S. Tenn. stateline, 16-IV-1976, A. M. James (R. F. Surdick).

ETYMOLOGY.—The Latin adjective *hamata* refers to the barb-like appearance of the epiproct tip.

DIAGNOSIS.—*Alloperla hamata* belongs to the species group including *A. banksi* Frison (Fig. 15) and *A. imbecilla* (Say) (Fig. 14). Most similar to the former, it is distinguished by the thinness and increased taper of the epiproct tip. *A. hamata*, however, bears a thicker and less tapered epiproct tip than *A. imbecilla*. Females of all three species are similar. *Alloperla hamata* probably represents

the southernmost isolate of a far-ranging species ancestral to the *Alloperla imbecilla* group.

Alloperla leonarda Ricker

Alloperla leonarda Ricker, 1952: 176, figs. 132, 135.

Alloperla quadrata Harden & Mickel, 1952: 61, pl. X, fig. 6. *New synonymy*

Comparison of the female holotype of *Alloperla quadrata* Harden & Mickel with the female allotype and specimens of *Alloperla leonarda* Ricker indicated synonymy of the two species. The abbreviated subgenital plate of *A. quadrata* appears to be within the genetic variation and physical distortion of *A. leonarda*. *Alloperla quadrata* was also collected within the geographic range of *A. leonarda*.

Alloperla roberti, sp. nov.

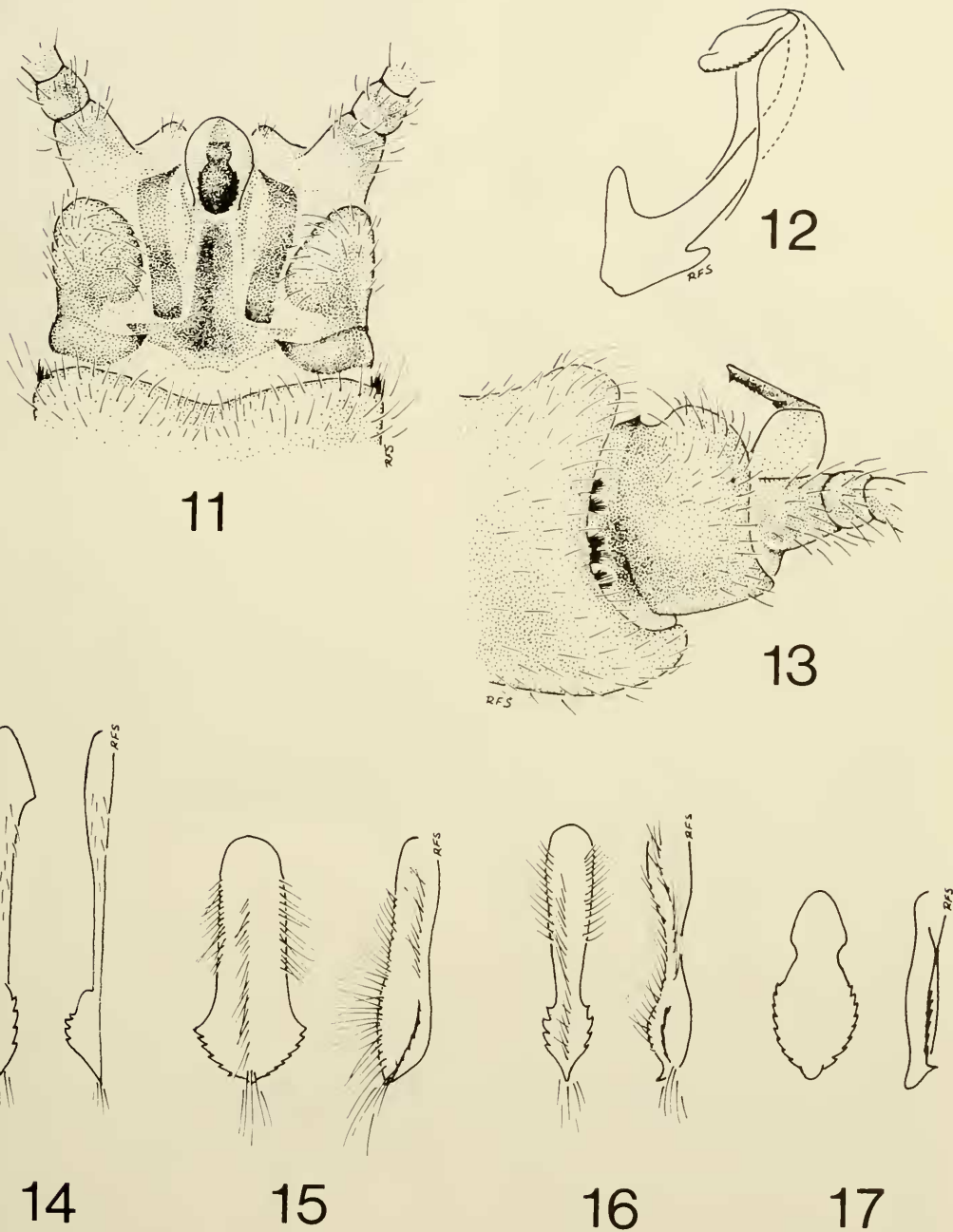
Figs. 11–13, 17

Alloperla banksi Frison, 1942: 343 (in part)

Examination of holotype, allotype, and paratypes of *Alloperla banksi* Frison revealed two specimens of a new species. Originally designated paratypes of *A. banksi*, these two specimens were of particular interest to Frison (1942) because they represented the only record of the species in Illinois. Frison's concern over the loss of habitat eliminating *A. banksi* from Illinois is even more sententious, since a separate endemic species is involved.

General color dusky in alcohol. Antennae pale basally, darker apical three-fourths; head unpatterned except for three dark ocellar rings; occiput short, lateral edges tapering posterior to compound eyes. Pronotum narrower than head, squarely oval, unpatterned, mesonotum, metanotum, and abdomen lacking dark markings. Wings macropterous, hyaline, representative of genus without reduction in venation.

MALE.—Forewing length 6.5 mm; body length 5.5 mm. Epiproct tip twice as long as wide, oval in dorsal aspect, flattened in lateral aspect, with a minute apical protrusion and serrate margins terminating before base. Cowl not enlarged. Basal anchor twice as wide as long; paragenital plates as wide as basal bar. Aedeagus membranous. Lateral brushes on segments 6 through 9.



Figs. 11-17. *Alloperla roberti*: (11) male terminalia, dorsal; (12) epiproct, $\frac{3}{4}$ view; (13) male terminalia, lateral. Epiproct tip: (14) *Alloperla imbecilla*; (15) *Alloperla banksi*; (16) *Alloperla hamata*; (17) *Alloperla roberti*.

MATERIAL.— Holotype ♂ (M.C.Z. # 32559), paratype ♂ (Illinois Natural History Survey); Illinois, Rock Island, 1860, B. D. Walsh.

ETYMOLOGY.— *Alloperla roberti* is named in honor of my father, Robert W. Surdick. An entomologist, artist, and naturalist, he has been my mentor and colleague.

DIAGNOSIS.—*Alloperla roberti* most closely resembles *A. banksi* (Fig. 15) but differs in the shape of the epiproct tip. *Alloperla roberti* bears a more ovoid, flatter epiproct tip, with longer serrated margins. *Alloperla serrata* Needham & Claassen, a western Nearctic relative, possesses a similar but more round-pillow-shaped epiproct tip with a broad anterior margin of serrations.

Triznaka spinosa, sp. nov.

Figs. 18-22

General color pale tan in alcohol. Antennae pale basally, dusky apical two-thirds; head unpatterned except for three dark ocellar rings; occiput narrow with lateral edges tapering immediately posterior to compound eyes. Pronotum rectangular, twice as wide as long, slightly narrower than head at compound eyes; corners rounded; lateral margins dusky. Mesonotum and metanotum each with dark sutures including W-mark resulting from dark recurrent scutoscuteellar suture and bisecting line. Abdomen with dark median longitudinal stripe from tergum 1 tapering to 7, with lateral dusky stripes on terga 1 and 2. Cercal segments 10-11. Wings macropterous, hyaline, representative of genus.

MALE.—Forewing length 6 mm; body length 5.5 mm. Epiproct tip darkly sclerotized, thorn-shaped in all aspects, as long as wide dorsally. Basal bar nearly parallel-sided, merged with basal anchor, twice as long as greatest width, moderately sclerotized with scattered setae; paragenital plates absent. Anal lobe with scattered, posteriorly directed hairs. Tergum 9 little modified but with slight posterior curve, thickened setae. Aedeagus patterned with golden spinulae forming round patch basal to V-shaped patch with small adjacent spots and median stripe; with minute colorless scales and pair of fine terminal extensions. Hammer absent.

FEMALE.—Forewing length 7 mm; body length 7 mm. Subgenital plate with semi-circular margin in ventral aspect; basal width three-fourths width segment 8; posterior extension of flap two-thirds length segment 8; flap concave in lateral aspect. Plate evenly hirsute except for thin, hairless, slight indentation at junction of flap and posterior margin segment 8; long, evenly spaced hairs

along margin of flap, thicker towards base of flap. Segment 8 evenly fringed with long hairs on posterior margin. Sternite 9 lacking hairs medially. Vagina thickened, lightly sclerotized.

MATERIAL.—Holotype ♂, allotype, 20 ♂, 7 ♀ paratypes: California, Nevada Co., Sagehen Spring, 27-VI-1966, A. L. Sheldon (USNM #76888). Other paratypes: 2 ♀ California, Sierra Co., Salmon Crk., 11-VII-1971, D. G. Denning (USNM); 1 ♂, 1 ♀ California, Nevada Co., Sagehen Spring, 27-VI-1966, A. L. Sheldon (R. F. Surdick); 5 ♂, 5 ♀ California, Nevada Co., Sagehen Crk., Upper Carpenter Spring, 21-VII-1966, A. L. Sheldon (USNM, R. F. Surdick); 1 ♂ California, Nevada Co., Sagehen Crk., Lower Carpenter Spring, 21-VII-1966, A. L. Sheldon (USNM); 2 ♂ California, Nevada Co., Sagehen Crk., 27-VI-1966, A. L. Sheldon (USNM).

ETYMOLOGY.—The Latin adjective *spinosa* refers to the thornlike epiproct tip.

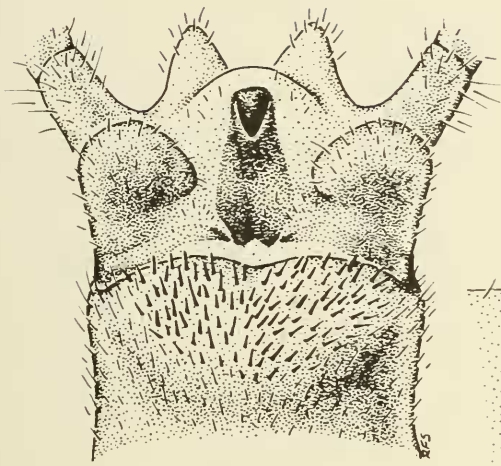
DIAGNOSIS.—*Triznaka spinosa* is distinct as the only member of the genus with an acutely pointed epiproct tip. Both *T. pintada* (Ricker) and *T. signata* (Banks) bear bluntly pointed epiprocts and are distinctly marked with black on head and thorax. *Triznaka diversa* (Frison), although similar to *T. spinosa* in pigmentation, bears a chisel-shaped epiproct tip in the male and a smaller subgenital plate flap in the female.

Bisancora, gen. nov.

Type-species: *Bisancora rutiformis*, sp. nov.

General body form and head shape representative of Chloroperlinae. Pronotum square with rounded corners; margin of equal width. Mesobasisternal Y-ridge with median ridge extending nearly to mesosternacosta. Wing venation representative of Chloroperlinae, lacking reductions, macropterous, hyaline.

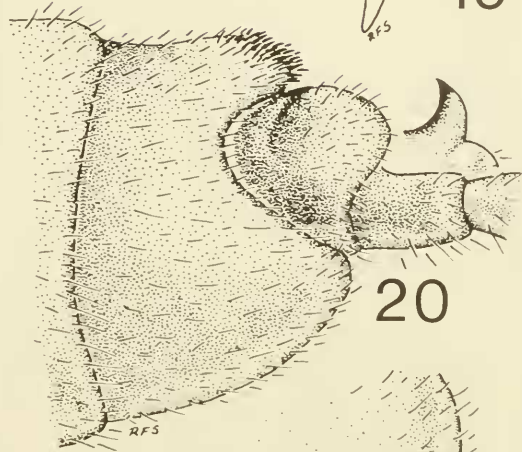
MALE.—Terminal abdominal segments with lateral brushes; hammer absent; segments 7-9 unmodified except for slight medial indentation of posterior margin of tergum 9; tergum 10 completely cleft. Epiproct erectile; tip hinged, recurved, variously flattened and curved or curled; basal rod and paragenital plates equally wide, sclerotized; basal anchor double with width of large anterior anchor half of segment width, width of



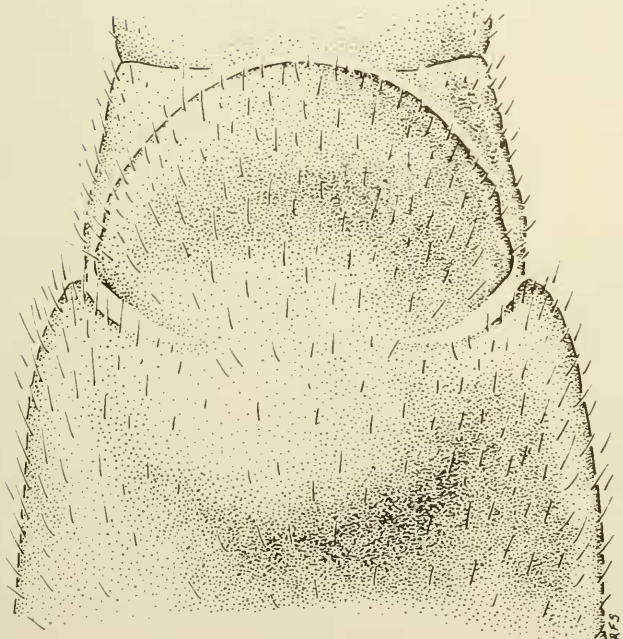
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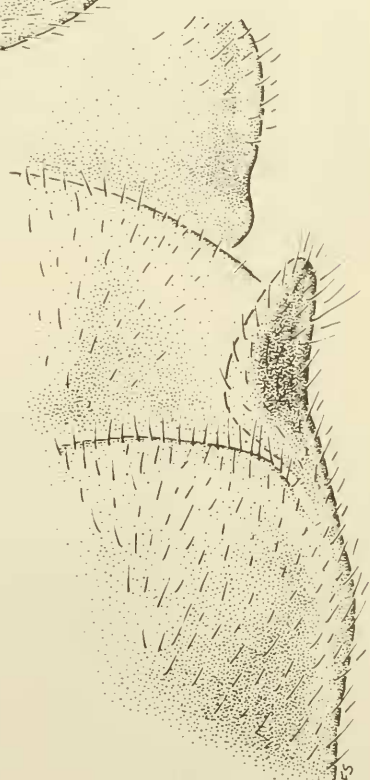
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Figs. 18-22. *Triznaka spinosa*: (18) male terminalia, dorsal; (19) epiproct, $\frac{3}{4}$ view; (20) male terminalia, lateral; (21) female terminalia, ventral; (22) female terminalia, lateral.

sequential posterior anchor one-fourth segment width. Aedeagus terminating in four large processes; dorsal flaps variously lightly sclerotized; ventral digitate extensions and remainder of aedeagus membranous.

FEMALE.—Terminal abdominal segments with lateral brushes, lacking hammer. Subgenital plate distinct from remainder of sternum 8 by indentation and darker sclerotization; margin variously excised or scalloped and setose.

ETYMOLOGY.—The generic term *Bisancora* is a combination of two Latin words: *bis*, meaning twin, and *ancora*, meaning anchor. It refers to the sequentially double basal anchor. The name is feminine.

DIAGNOSIS.—The genus *Bisancora* can be distinguished from closest relatives, *Sweltsa* Ricker and *Alloperla* Banks, by the squared pronotum, brown pigmentation, and markings. The double anchor and unique epiproct tip characterize the males, and the distinctively scalloped subgenital plate characterizes the females. Both *Sweltsa* and *Alloperla* bear a more thickened or inflated epiproct tip, and, except for *Sweltsa albertensis* (Needham & Claassen), *S. lamba* (Needham & Claassen), and *S. gaufini* Baumann, a membranous aedeagus.

Presently, only two species are included in the genus, *B. rutriformis* and *B. pastina* (Jewett), comb. nov.

Bisancora rutriformis, sp. nov.

Figs. 23-32

General color light brown in alcohol. Antennae pale except for dark basal segment; head with three dark ocellar rings, medial dark rectangle anterior to occipital suture and extending to clypeus; occiput short with lateral edges tapering immediately posterior to compound eyes; mandibles with four sclerotized teeth. Pronotum narrower than head by width of compound eyes, square with rounded corners and wide, even margins; darkly pigmented along anterior and posterior margins with two longitudinal stripes bordering a median thin light stripe. Mesonotum, metanotum, and sternum dusky, with only slight darkening of recurrent scutocutellar sutures; mesobasisternal Y-ridge with median ridge extending nearly to meso-

sternacosta. Abdomen with median and lateral longitudinal dark stripes extending from tergum 1 through 8; cercal segments 7-9. Wings hyaline with dusky veins, macropterous.

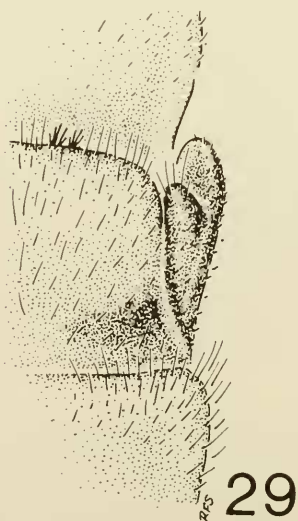
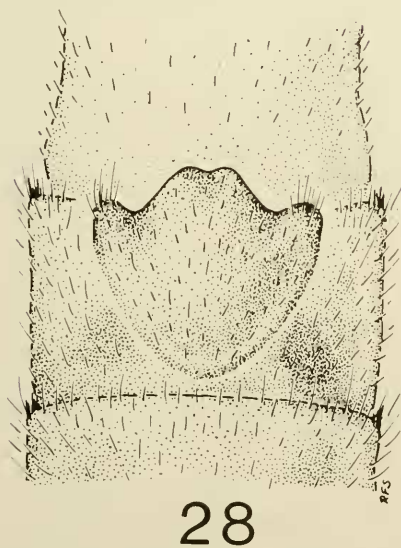
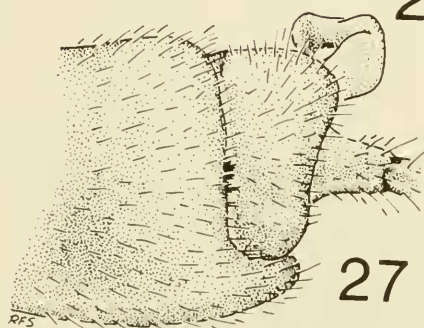
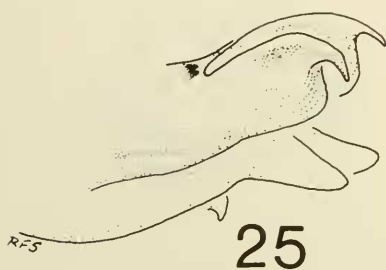
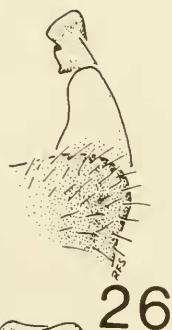
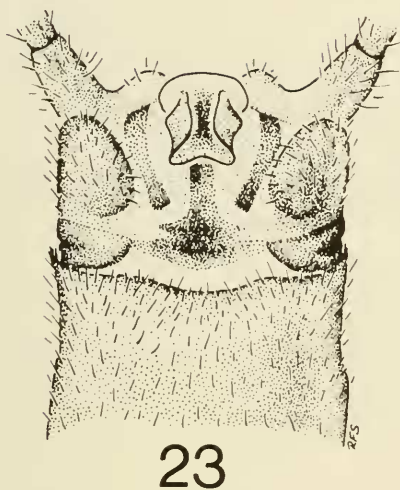
MALE.—Forewing length 5 mm; body length 4.5 mm. Epiproct tip as long as wide, moderately sclerotized, with lateral margins of thin leaflet curled dorsally forming a deep scoop; in dorsal aspect, narrow base of scoop doubles in width then narrows again distally, terminating in a flared anterior margin; in lateral aspect, greatest depth equals length, lip of scoop curled ventrally. Paragenital plates equal basal bar in width, terminate anteriorly adjacent to arms of small anchor. Large basal anchor half width of tergum 10, twice width of posteriorly successive small anchor. Tergite 9 slightly concave on posterior margin, lacking other modification of sclerite or setae. Hammer absent. Aedeagus terminating in dorsal pair of lightly sclerotized, blunt flaps and ventral pair of membranous fingers. Lateral brushes barely visible on segments 7 and 8.

FEMALE.—Forewing length 5.5 mm; body length 5.5 mm. Subgenital plate tulip-shaped, as long as wide, slightly swollen and generally more darkly pigmented than remainder of sternum, with circumference distinct by indentation and lack of setation; posterior margin forms three convex scallops, with median scallop half plate width, one-fourth plate length, and lateral scallops half size of median scallop; setation light, even except for long, dense hairs on lateral scallops. Vagina thickened, not sclerotized. Lateral brushes barely visible on segments 7 and 8.

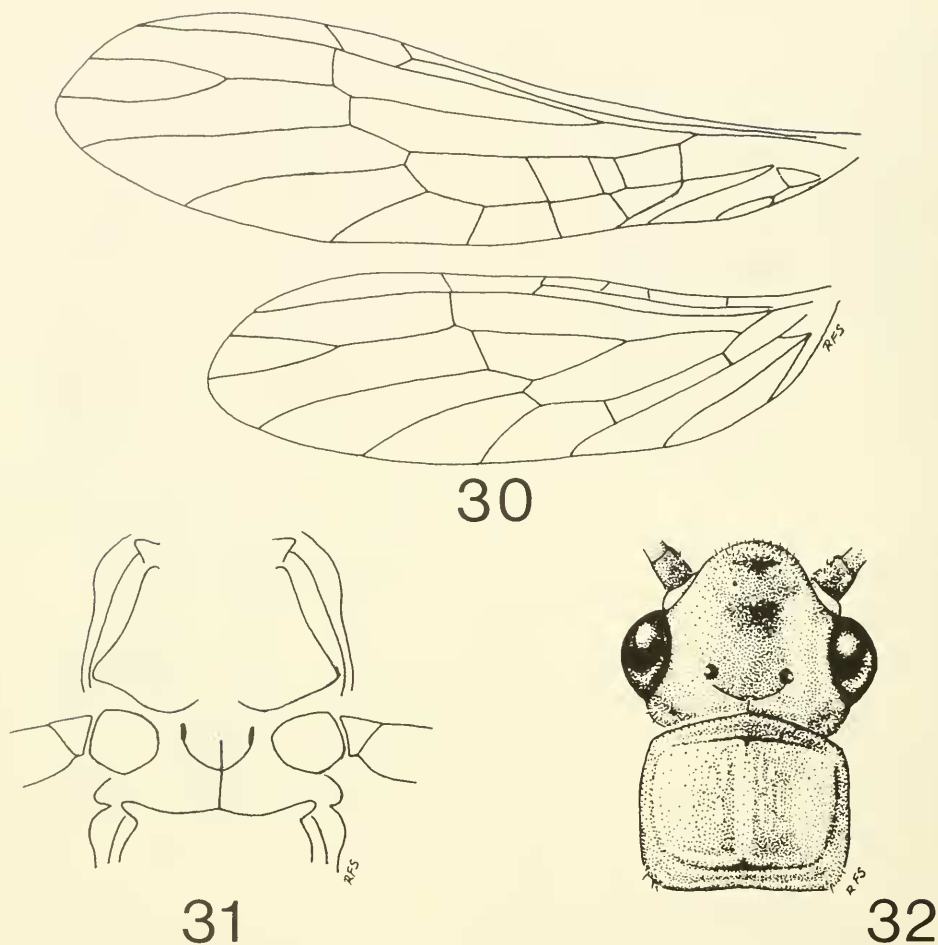
MATERIAL.—Holotype ♂, allotype (USNM #76889), paratypes 2♂, 5♀ (R. W. Baumann): California, Los Angeles Co., San Gabriel Mts., Little Rock Crk., near Little Rock and Palmdale, 9-VI-1974, C. M. Murvosh. Other paratypes: 1♂, 2♀ California, Alameda Co., Sunol Regional Park, 24-IV-1971, D. G. Denning (R. F. Surdick).

ETYMOLOGY.—The epithet *rutriformis* is a combination of the Latin words *rutrum*, meaning shovel, and *formis*, meaning shaped. It describes the flour-scoop shape of the epiproct tip.

DIAGNOSIS.—*Bisancora rutriformis* differs from *B. pastina* (Jewett) in the scooplake



Figs. 23-29. *Bisancora rutriformis*: (23) male terminalia, dorsal; (24) epiproct, $\frac{3}{4}$ view; (25) aedeagus, $\frac{3}{4}$ lateral view; (26) male terminalia, lateral with epiproct tip elevated; (27) male terminalia, lateral, with epiproct tip not elevated; (28) female terminalia, ventral; (29) female terminalia, lateral.



Figs. 30-32. *Bisancora rutriformis*: (30) wings; (31) mesobasisternal Y-ridge, adult; (32) adult head, pronotum.

epiproct tip and in sclerotization of the dorsal leaves of the aedeagus. *Bisancora pastina* (Figs. 33-35) bears a flat, sheetlike epiproct tip that widens distally to two thick lateral prongs. Females differ in the length of the subgenital plate produced beyond the margin of sternum 8. In *B. pastina* (Figs. 36, 37), the median scallop is half as long as in *B. rutriformis*.

Bisancora pastina (Jewett), comb. nov.
Figs. 33-37

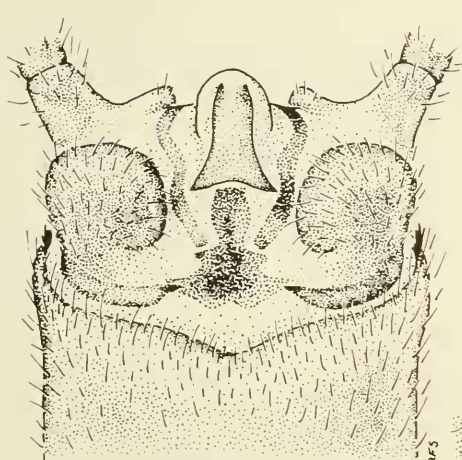
Alloperla (*Sweltsa*) *pastina* Jewett, 1962: 20, Fig. 6.
Sweltsa pastina: Illies, 1966: 455.

The flat epiproct tip, double basal anchor, and unmodified terminal terga, as well as similar subgenital plate, and aedeagus

indicate the affinity of *B. pastina* with *B. rutriformis*.

ACKNOWLEDGMENTS

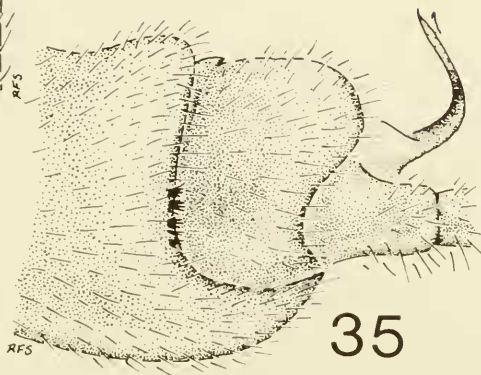
Appreciation is extended to Dr. B. P. Stark, Mississippi College; Dr. R. W. Baumann, Brigham Young University; Dr. O. S. Flint, U.S. National Museum; Dr. J. D. Unzicker, Illinois State Natural History Survey; M. M. Peace, Museum of Comparative Zoology; Drs. E. F. Cook and P. J. Clausen, University of Minnesota; and A. M. James, Texas Instruments Corp., Dallas, for their kind assistance and loans of specimens. I am grateful for the support of the Department of Biology, University of Utah.



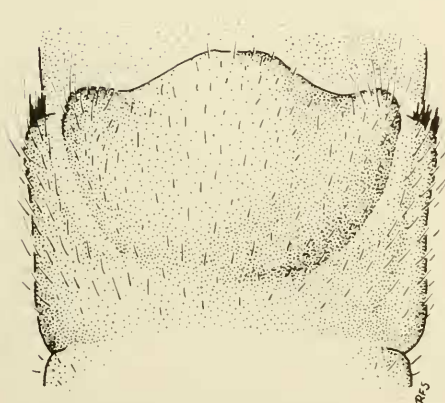
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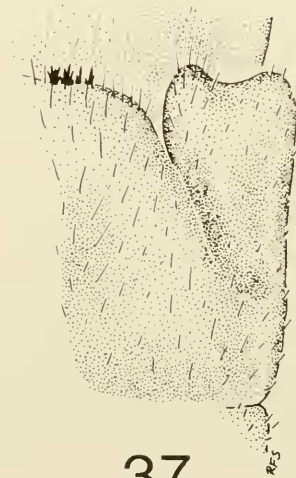
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Figs. 33-37. *Bisancora pastina*: (33) male terminalia, dorsal; (34) epiproct, $\frac{3}{4}$ view; (35) male terminalia, lateral; (36) female terminalia, ventral; (37) female terminalia, lateral.

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